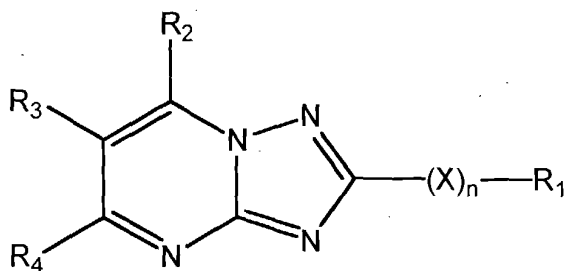


## [000202] WHAT IS CLAIMED IS:

1. A combination comprising a polypeptide comprising the modulating sequence of the erythropoietin receptor and a non-peptide organic molecule of from 12 to 36 atoms other than hydrogen, from 9 to 20 carbon atoms, and from 4 to 12 of the heteroatoms chalcogen, nitrogen, halogen, and metal ion of Groups I and II of the periodic chart, and of the formula:

(1)



wherein:

X is of from 1 to 7 atoms other than hydrogen and is oxygen, sulfur bonded to 0 to 2 oxygen atoms, amino and alkyl substituted amino;

n is 0 or 1;

R<sub>1</sub> is hydrogen or an organic group of from 1 to 12 carbon atoms and from 0 to 6 heteroatoms, which are chalcogen, nitrogen, and halogen consisting of an aliphatic group of from 1 to 6 carbon atoms having from 0 to 2 sites of unsaturation, non-oxo-carbonyl and the nitrogen and sulfur derivatives thereof, alicyclic having from 0 to 2 sites of unsaturation, aryl, heterocyclic and combinations thereof, where the cyclic structures may have from 1 to 2 rings;

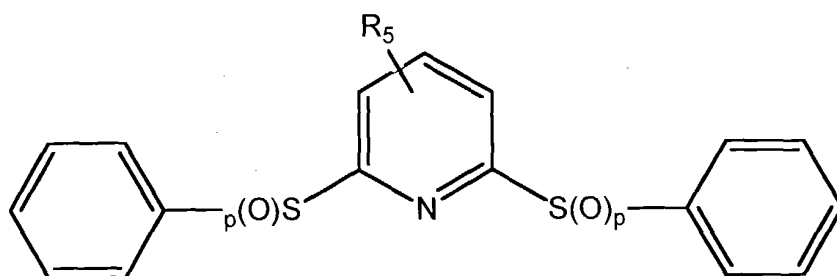
R<sub>2</sub> is hydrogen, a heterofunctionality having nitrogen and/or chalcogen bonded to annular carbon, a heterofunctionality having nitrogen and/or chalcogen bonded to

annular carbon to which is substituted with an organic group of from 1 to 10 carbon atoms, aryl, alkaryl, aralkyl and aralkenyl of from 5 to 10 carbon atoms, aroyl of from 6 to 10 carbon atoms, or an organic group bonded through a carbon atom of from 1 to 12 carbon atoms having from 1 to 4, as described above for  $R_1$ ;  $R_3$  is hydrogen or an organic group of from 1 to 10 carbon atoms and from 0 to 4 chalcogen and nitrogen heteroatoms;

$R_4$  is hydrogen or alkyl and substituted alkyl of from 1 to 6 carbon atoms, where the substituents are oxy, amino and halo;

with the proviso that  $R_3$  and  $R_4$  can be taken together to form a ring with the annular atoms to which they are attached of from 4 to 10 annular atoms and forming from 1 to 2 rings, where the annular atoms are unsubstituted or substituted with halo, alkyl of from 1 to 3 carbon atoms, oxy of from 0 to 3 carbon atoms, thio of from 0 to 3 carbon atoms and amino of from 0 to 4 carbon atoms;

(2)

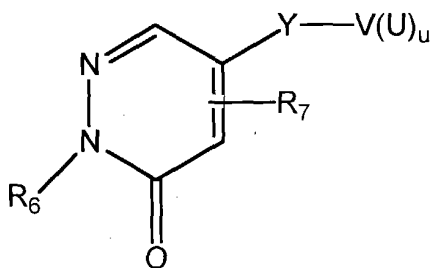


wherein:

$p$  is 0, 1 or 2; and

$R_5$  is a group having from 1 to 3 atoms other than hydrogen and is oxy, thio, amino, nitro, cyano, and alkyl;

(3)



wherein:

$Y$  is  $O$ ,  $S(O)_m$ , wherein  $m$  is 0, 1 or 2, amino or  $CH_2$ ;

$R_6$  is  $H$  or alkyl of from 1 – 3 carbon atoms;

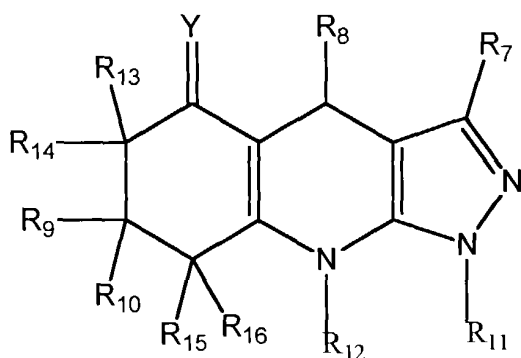
$R_7$  is hydrogen, or a group of from 0 to 3 atoms other than hydrogen, and is oxy, thio amino, nitro, cyano, and alkyl;

$V$  is an aryl group having 6 annular members comprising 0 to 2 nitrogen atoms and the remainder carbon atoms

$U$  is a substituent group of from 0 to 5 atoms other than hydrogen, and is oxy, thio amino, nitro, cyano, halo, and alkyl; and

$u$  is 0 to 3; and

(4) diazoloheptahydroquinoline



wherein:

Y is oxygen, sulfur, NH, (alkyl of from 1 to 3 carbon atoms, H) or H<sub>2</sub>

R<sub>7</sub> is hydrogen or an organic group of from 1 to 12 carbon atoms and 0 to 4 heteroatoms;

R<sub>8</sub> is hydrogen, an aliphatic group of from 1 to 6 carbon atoms or a heterocycle of from 5 to 6 annular members and from 1 to 2 heteroannular members that are oxygen, nitrogen or sulfur; and

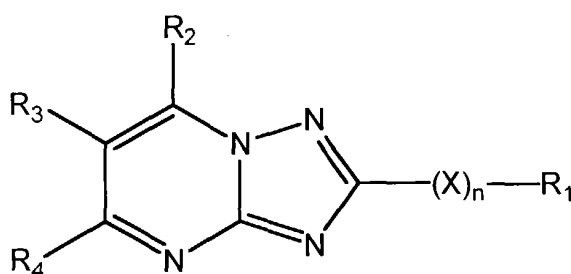
R<sub>9</sub>, R<sub>10</sub>, R<sub>13</sub>, R<sub>14</sub>, R<sub>15</sub> and R<sub>16</sub> are the same or different and are hydrogen or an organic radical of from 1 to 12 carbon atoms or a heterosubstituent of from 1 to 3 heteroatoms;

R<sub>11</sub> and R<sub>12</sub> are the same or different and are hydrogen or an organic group of from 1 to 12 carbon atoms.

2. A combination according to Claim 1, wherein said polypeptide and said non-peptide organic molecule are complexed at the modulating domain of EPO-R.

3. A combination according to Claim 2, wherein said polypeptide is EPO-R bound to a cellular membrane.
4. A combination comprising a polypeptide comprising the modulating domain sequence of the erythropoietin receptor and a non-peptide organic molecule of from 12 to 36 atoms other than hydrogen, from 9 to 20 carbon atoms, and from 4 to 12 of the heteroatoms chalcogen, nitrogen, halogen, and metal ion of Groups I and II of the periodic chart, and of the formula:

(1)



wherein:

X is of from 1 to 3 atoms other than hydrogen and is oxygen, sulfur bonded to 0 to 2 oxygen atoms, amino and alkyl substituted amino;

n is 0 or 1;

R<sub>1</sub> is a lower alkyl group of 1 to 3 carbon atoms or an organic group having a six annular membered aromatic group having from 0 to 3 substituents, where the substituents are halo, lower alkyl of from 1 to 3 carbon atoms, nitro, trihalomethyl, and is either directly bonded to X or bonded through a linking group of from 1 to 4 carbon, nitrogen, or chalcogen atoms in the chain, being particularly carbon and nitrogen, and there being from 0 to 2 heteroatoms in the chain, where heteroatoms are bonded solely to carbon and hydrogen, or -acetamidinyl having from 0 to 1 N-OH;

R<sub>2</sub> is hydrogen, amino of 0 to 3 carbon atoms, oxy of from 0 to 3 carbon atoms, a heterofunctionality having nitrogen or chalcogen bonded to annular carbon to which is substituted an organic group of from 1 to 10 carbon atoms and from 0 to 3 heteroatoms;

R<sub>3</sub> is hydrogen or an organic group of from 1 to 10 carbon atoms and from 0 to 4 chalcogen and nitrogen heteroatoms;

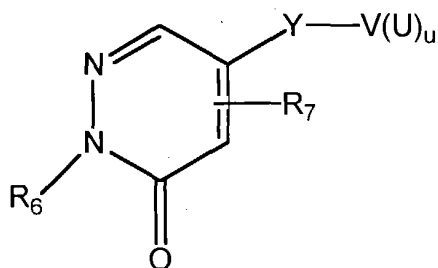
R<sub>4</sub> is hydrogen, alkyl or substituted alkyl of from 1 to 6 carbon atoms, where the substituents are oxy, amino and halo;

with the proviso that R<sub>3</sub> and R<sub>4</sub> can be taken together to form a ring with the annular atoms to which they are attached of from 4 to 10 annular atoms and forming from 1 to 2 rings, where the annular atoms are unsubstituted or substituted with halo, alkyl of from 1 to 3 carbon atoms, oxy of from 0 to 3 carbon atoms, thio of from 0 to 3 carbon atoms and amino of from 0 to 4 carbon atoms.

5. A combination according to Claim 4, wherein R<sub>3</sub> is hydrogen or an organic group of from 1 to 8 carbon atoms and 0 to 4 chalcogen, nitrogen and halo heteroatoms.
6. A combination according to Claim 5, wherein R<sub>3</sub> is cyclopropylmethylamino.
7. A combination according to Claim 5, wherein R<sub>3</sub> is H.
8. A combination according to Claim 4, wherein R<sub>1</sub> is a six annular membered aromatic group having from 0 to 3 substituents, where the substituents are halo, lower alkyl of from 1 to 3 carbon atoms, nitro, trihalomethyl, and is either directly bonded to X or bonded through a linking group of from 1 to 4 carbon, nitrogen, or chalcogen atoms in the chain.
9. A combination according to Claim 4, wherein R<sub>4</sub> is methyl.
10. A combination according to Claim 4, wherein R<sub>4</sub> is H.

11. A combination comprising a polypeptide comprising the modulating sequence of the erythropoietin receptor and a non-peptide organic molecule of from 12 to 36 atoms other than hydrogen, from 9 to 20 carbon atoms, and from 4 to 12 of the heteroatoms chalcogen, nitrogen, halogen, and metal ion of Groups I and II of the periodic chart, and of the formula:

(3)



wherein:

Y is O, S(O)<sub>m</sub>, wherein m is 0, 1 or 2, amino or CH<sub>2</sub>;

R<sub>6</sub> is H or alkyl of from 1 – 3 carbon atoms;

R<sub>7</sub> is hydrogen, or a group of from 0 to 3 atoms other than hydrogen, and is oxy, thio amino, nitro, cyano, and alkyl;

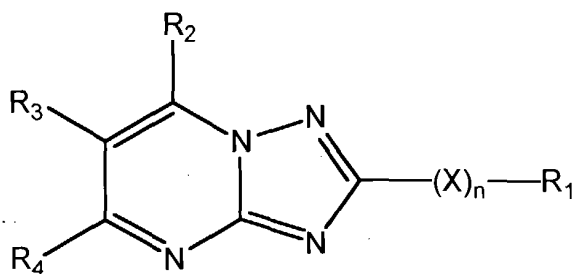
V is a phenyl group;

U is oxy, thio amino, nitro, cyano, halo, and alkyl and from 0 to 3 atoms other than hydrogen; and u is 0 to 3.

12. A combination according to Claim 11, wherein Y is SO<sub>2</sub>, V is phenyl, R<sub>7</sub> is Cl and u is 0.
13. A combination comprising a polypeptide comprising the modulating domain sequence of the erythropoietin receptor and a non-peptide organic molecule of from 12 to 36 atoms other than hydrogen, from 9 to 20 carbon

atoms, and from 4 to 12 of the heteroatoms chalcogen, nitrogen, halogen, and metal ion of Groups I and II of the periodic chart, and of the formula:

(1)



wherein:

R<sub>1</sub> is alkyl of from 1 to 3 carbon atoms, substituted phenyl having from 0 to 3 substituents that are CH<sub>3</sub>, Cl, NO<sub>2</sub>, and CF<sub>3</sub> and bonded directly to an annular carbon atom or through a linking group of from 1 to 3 carbon and nitrogen atoms in the chain or N-hydroxyamidinyl;

R<sub>2</sub> is CH<sub>3</sub>, NH<sub>2</sub>, OH, and aroylamido of from 7 to 8 carbon atoms having from 0 to 2 substituents that are CH<sub>3</sub>, Cl, NO<sub>2</sub>, and CF<sub>3</sub>;

R<sub>3</sub> is cycloalkylalkyl of from 4 to 8 carbon atoms, having from 3 to 4 annular atoms, H or carboxy;

R<sub>4</sub> is H, lower alkyl of from 1 to 3 carbon atoms or alkoxymethyl of from 2 to 4 carbon atoms;

with the proviso that R<sub>3</sub> and R<sub>4</sub> may be taken together to define 1,2-dimethylene-\_\_halo, \_\_-CH<sub>3</sub>-halobenzene, where halo is F or Cl. A method for modulating the activity of EPO-R present as a cell membrane component comprising:

forming a complex by bringing together the members of the combination of Claim 13 under complex forming conditions, where said polypeptide is EPO-R.



14. A method for modulating the activity of EPO-R present as a cell membrane component comprising:

forming a complex by bringing together the members of the combination of Claim 13 under complex forming conditions, where said polypeptide is EPO-R.

5. A combination

6. A combination according to Claim 5, wherein  $R_3$  is cyclopropylmethylamino.

7. A combination according to Claim 5, wherein  $R_3$  is H.

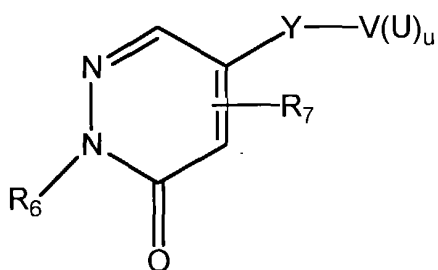
8. A combination according to Claim 4, wherein  $R_1$  is a six annular membered aromatic group having from 0 to 3 substituents, where the substituents are halo, lower alkyl of from 1 to 3 carbon atoms, nitro, trihalomethyl, and is either directly bonded to X or bonded through a linking group of from 1 to 4 carbon, nitrogen, or chalcogen atoms in the chain.

9. A combination according to Claim 4, wherein  $R_4$  is methyl.

10. A combination according to Claim 4, wherein  $R_4$  is H.

11. A combination comprising a polypeptide comprising the modulating sequence of the erythropoietin receptor and a non-peptide organic molecule of from 12 to 36 atoms other than hydrogen, from 9 to 20 carbon atoms, and from 4 to 12 of the heteroatoms chalcogen, nitrogen, halogen, and metal ion of Groups I and II of the periodic chart, and of the formula:

(3)



wherein:

Y is O, S(O)<sub>m</sub>, wherein m is 0, 1 or 2, amino or CH<sub>2</sub>;

R<sub>6</sub> is H or alkyl of from 1 – 3 carbon atoms;

R<sub>7</sub> is hydrogen, or a group of from 0 to 3 atoms other than hydrogen, and is oxy, thio amino, nitro, cyano, and alkyl;

V is a phenyl group;

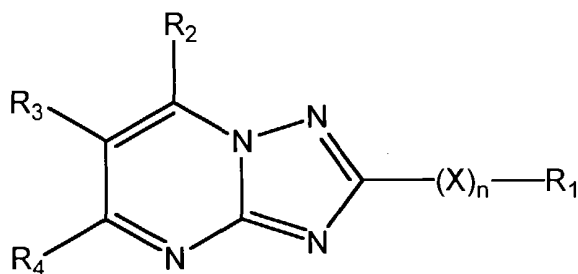
U is oxy, thio amino, nitro, cyano, halo, and alkyl and from 0 to 3 atoms other than hydrogen; and

u is 0 to 3.

12. A combination according to Claim 11, wherein Y is SO<sub>2</sub>, V is phenyl, R<sub>7</sub> is Cl and u is 0.

13. A combination comprising a polypeptide comprising the modulating domain sequence of the erythropoietin receptor and a non-peptide organic molecule of from 12 to 36 atoms other than hydrogen, from 9 to 20 carbon atoms, and from 4 to 12 of the heteroatoms chalcogen, nitrogen, halogen, and metal ion of Groups I and II of the periodic chart, and of the formula:

(1)



wherein:

$R_1$  is alkyl of from 1 to 3 carbon atoms, substituted phenyl having from 0 to 3 substituents that are  $CH_3$ ,  $Cl$ ,  $NO_2$ , and  $CF_3$  and bonded directly to an annular carbon atom or through a linking group of from 1 to 3 carbon and nitrogen atoms in the chain or N-hydroxyamidinyl;

$R_2$  is  $CH_3$ ,  $NH_2$ ,  $OH$ , and aroylamido of from 7 to 8 carbon atoms having from 0 to 2 substituents that are  $CH_3$ ,  $Cl$ ,  $NO_2$ , and  $CF_3$ ;

$R_3$  is cycloalkylalkyl of from 4 to 8 carbon atoms, having from 3 to 4 annular atoms, H or carboxy;

$R_4$  is H, lower alkyl of from 1 to 3 carbon atoms or alkoxymethyl of from 2 to 4 carbon atoms;

with the proviso that  $R_3$  and  $R_4$  may be taken together to define 1,2-dimethylene-\_\_-halo, \_\_- $CH_3$ -halobenzene, where halo is F or Cl.

14. A method for modulating the activity of EPO-R present as a cell membrane component comprising:

forming a complex by bringing together the members of the combination of Claim 13 under complex forming conditions, where said polypeptide is EPO-R.

15. A method for modulating the activity of EPO-R comprising:

forming a complex by bringing together the members of the combination of Claim 11 under complex forming conditions, where said polypeptide is EPO-R.

16. A compound according to Claim 13 and a pharmaceutically acceptable vehicle.

17. A compound according to Claim 11 and a pharmaceutically acceptable vehicle.

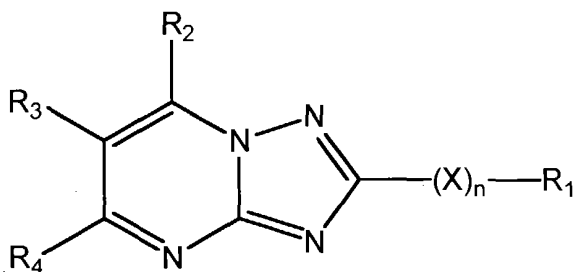
18. A method of determining the binding affinity of a test compound to the modulating domain of EPO-R, said method comprising:

adding said test compound to a combination according to Claim 1 and determining the amount of complex of said combination in the presence of said test compound as compared to the absence of said test compound.

19. A method of inducing a physiological response of EPO-R in a host, said method comprising:

administering to said host a physiologically effective amount of a non-peptide organic molecule of from 12 to 36 atoms other than hydrogen, from 9 to 20 carbon atoms, and from 4 to 12 of the heteroatoms chalcogen, nitrogen, halogen, and metal ion of Groups I and II of the periodic chart, and of the formula:

(1)



wherein:

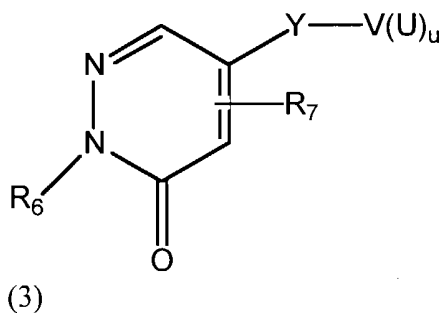
$R_1$  is alkyl of from 1 to 3 carbon atoms, substituted phenyl having from 0 to 3 substituents that are  $\text{CH}_3$ ,  $\text{Cl}$ ,  $\text{NO}_2$ , and  $\text{CF}_3$  and bonded directly to an annular carbon atom or through a linking group of from 1 to 3 carbon and nitrogen atoms in the chain, N-hydroxyamidinyl;

$R_2$  is  $\text{CH}_3$ ,  $\text{NH}_2$ ,  $\text{OH}$ , and aroylamido of from 7 to 8 carbon atoms having from 0 to 2 substituents that are  $\text{CH}_3$ ,  $\text{Cl}$ ,  $\text{NO}_2$ , and  $\text{CF}_3$ ;

$R_3$  is cycloalkylalkyl of from 4 to 8 carbon atoms, having from 3 to 4 annular atoms, H or carboxy;

$R_4$  is H, lower alkyl of from 1 to 3 carbon atoms or alkoxyethyl of from 2 to 4 carbon atoms;

with the proviso that  $R_3$  and  $R_4$  may be taken together to define 1,2-dimethylene-\_-halo, \_- $\text{CH}_3$ -halobenzene, where halo is F or Cl; or



wherein:

Y is O,  $\text{S}(\text{O})_m$ , wherein m is 0, 1 or 2, amino or  $\text{CH}_2$ ;

$R_6$  is H or alkyl of from 1 – 3 carbon atoms;

$R_7$  is hydrogen, or a group of from 0 to 3 atoms other than hydrogen, and is oxy, thio amino, nitro, cyano, and alkyl;

V is a phenyl group;

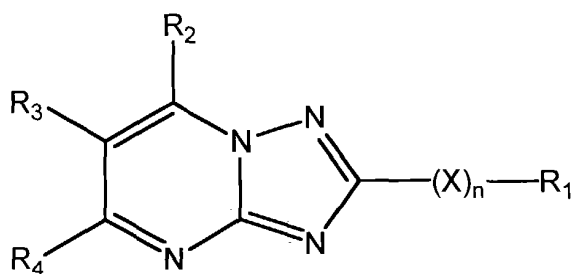
U is oxy, thio amino, nitro, cyano, halo, and alkyl and from 0 to 3 atoms other than hydrogen; and

u is 0 to 3.

20. A method according to Claim 19, wherein said non-peptide organic molecule is of formula 1.
21. A method according to Claim 20, wherein X is amino,  $R_2$  is o-methyl, p-chlorophenyl-1,  $R_2$  is H,  $R_3$  is cyclopropylmethylamino and  $R_4$  is methyl.
22. A method of modulating the response to a stimulus of hematopoietic or neuronal cells influenced by the binding of EPO to EPO-R, said method comprising:

contacting said cells with an effective amount to modulate said response of a non-peptide organic molecule of from 12 to 36 atoms other than hydrogen, from 9 to 20 carbon atoms, and from 4 to 12 of the heteroatoms chalcogen, nitrogen, halogen, and metal ion of Groups I and II of the periodic chart, and of the formula:

(1)



wherein:

R<sub>1</sub> is alkyl of from 1 to 3 carbon atoms, substituted phenyl having from 0 to 3 substituents that are CH<sub>3</sub>, Cl, NO<sub>2</sub>, and CF<sub>3</sub> and bonded directly to an annular carbon atom or through a linking group of from 1 to 3 carbon and nitrogen atoms in the chain, N-hydroxyamidinyl;

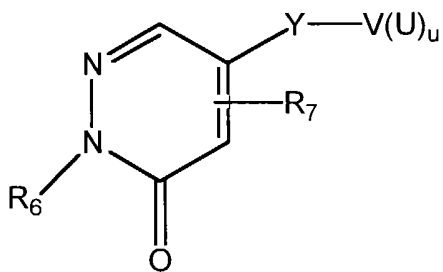
R<sub>2</sub> is CH<sub>3</sub>, NH<sub>2</sub>, OH, and aroylamido of from 7 to 8 carbon atoms having from 0 to 2 substituents that are CH<sub>3</sub>, Cl, NO<sub>2</sub>, and CF<sub>3</sub>;

R<sub>3</sub> is cycloalkylalkyl of from 4 to 8 carbon atoms, having from 3 to 4 annular atoms, H or carboxy;

R<sub>4</sub> is H, lower alkyl of from 1 to 3 carbon atoms or alkoxymethyl of from 2 to 4 carbon atoms;

with the proviso that R<sub>3</sub> and R<sub>4</sub> may be taken together to define 1,2-dimethylene-\_-halo, \_-CH<sub>3</sub>-halobenzene, where halo is F or Cl; or

(3)



wherein:

Y is O, S(O)<sub>m</sub>, wherein m is 0, 1 or 2, amino or CH<sub>2</sub>;

R<sub>6</sub> is H or alkyl of from 1 – 3 carbon atoms;

R<sub>7</sub> is hydrogen, or a group of from 0 to 3 atoms other than hydrogen, and is oxy, thio amino, nitro, cyano, and alkyl;

V is a phenyl group;

U is oxy, thio amino, nitro, cyano, halo, and alkyl and from 0 to 3 atoms other than hydrogen; and

u is 0 to 3.